

## CLAIMS

What is claimed is:

1. A bone plate assembly utilizing at least one bone screw for fixation of adjacent bones of a spine comprising:

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a base plate including at least one aperture extending therethrough; and screw retaining means mounted and movable on said plate between locked and unlocked positions relative to said aperture for preventing the bone screw from backing out from said base plate.

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2. The bone plate assembly according to claim 1, wherein said base plate further includes a longitudinal axis defined by a first end and a second end and a length along said axis sufficient to span between the adjacent vertebrae, said base plate further including an upper and a lower surface, said lower surface being adapted to engage the bones.

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3. The bone plate assembly according to claim 2, wherein said base plate is curved transverse to said longitudinal axis to conform the bone plate to the curvature of the vertebrae.

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4. The bone plate assembly according to claim 1, wherein said at least one aperture is selected from the group consisting of a circular hole, a bore, a slot, and polygonal opening.

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5. The bone plate assembly according to claim 3, wherein said bore includes at least one internal recess disposed in at least one of said upper and lower surfaces of said plate.

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6. The bone plate assembly according to claim 3, wherein said at least one aperture disposed between said ends of said bone fixation plate is disposed along said longitudinal axis of said bone fixation plate.

7. The bone plate assembly according to claim 3, wherein said elongated slot is disposed at a substantially acute angle with respect to said longitudinal axis of the base plate.

5 8. The bone plate assembly according to claim 4, wherein said aperture includes an outer edge.

9. The bone plate assembly according to claim 8, wherein said outer edge further includes at least one groove machined into said outer edge.

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10. The bone plate assembly according to claim 1, wherein said screw retaining means is further defined as an insert selected from the group consisting of a washer, ring, clip, and disk.

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11. The bone plate assembly according to claim 10, wherein said insert includes a center axis and an opening eccentric to said center axis.

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12. The bone plate assembly according to claim 11, wherein said insert is rotatable about said center axis between said locked and unlocked positions, wherein said opening of said insert is eccentric with said aperture of said base plate when in said locked position and said opening of said insert is concentric with said aperture of said base plate when in said unlocked position.

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13. The bone plate assembly according to claim 10, wherein said insert includes a tab for engaging said at least one groove located on along said outer edge of said aperture of said base plate.

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14. The bone plate assembly according to claim 13, wherein said tab engages said at least one groove to provide for said locked and unlocked positions.

15. The bone plate assembly according to claim 1, wherein said insert partially blocks a portion of the screw disposed in said aperture thereby defining said locked position.

16. The bone plate assembly according to claim 1, wherein said insert does not block a portion of the screw disposed in said aperture thereby defining said unlocked position.

5 17. The bone plate assembly according to claim 1, wherein said screw retaining means is flush with an outer surface of said base plate.

18. The bone plate assembly according to claim 1, wherein said screw retaining means engages the screw in said locked position and prevents any movement  
10 thereof.

19. The bone plate assembly according to claim 1, wherein said screw retaining means is spaced from said screw to allow the screw to pivot freely while said screw retaining means is in said locked position.

15 20. The bone plate assembly according to claim 1, wherein said screw retaining means is removably mounted to said base plate within said aperture, said aperture defined by a wall including a groove radially and outwardly recessed in said wall.

20 21. The bone plate assembly according to claim 20, wherein said screw retaining mechanism is within said groove and said screw retaining mechanism is a C-shaped washer that is collapsible to be inserted into said groove of said aperture.

25 22. A device for placement into an aperture of a base plate comprising screw retaining means mountable and movable on a plate between locked and unlocked positions relative to an aperture for preventing a bone screw from backing out from the base plate.

23. The device according to claim 22, wherein said screw retaining means is  
30 defined as an insert selected from the group consisting of a washer, ring, clip, and disk.

24. The device according to claim 23, wherein said insert includes a center axis and an opening eccentric to said center axis.

25. The device according to claim 24, wherein said insert is rotatable about said center axis between said locked and unlocked positions.

5 26. The device according to claim 23, wherein said insert includes a tab for engaging at least one groove located on along an outer edge of the aperture of the base plate, said tab engages at least one groove to provide for said locked and unlocked positions.

10 27. The device according to claim 22, wherein said insert partially blocks a portion of the screw disposed in said aperture thereby defining said locked position.

28. The device according to claim 22, wherein said insert does not block a portion of the screw disposed in said aperture thereby defining said unlocked position.

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29. The device according to claim 23, wherein said groove has an eccentric opening within said aperture and said opening lines up with said opening of said screw retaining mechanism in said unlocked position.

20 30. The device according to claim 22, wherein said screw retaining means engages the screw and prevents any movement thereof.

31. The device according to claim 22, wherein said screw retaining means allows the screw to pivot freely while said screw retaining means is in said locked position.

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32. The device according to claim 22, wherein said screw retaining means is removably mounted within the aperture of the base plate.

30 33. The device according to claim 22, wherein said screw retaining means maintains the screw below an upper surface of the base plate when in said locked position.

34. The device according to claim 22, wherein said screw retaining means is C-shaped.

35. The device according to claim 22, wherein said screw retaining means is U-shaped.

5 36. The device according to claim 22, wherein said screw retaining means is compressible about said central axis.

37. A snap ring for placement into an aperture of a base plate comprising screw retaining means mountable and movable on the plate between locked and unlocked 10 positions relative to the aperture for preventing a screw from backing out from the base plate.

15 38. The snap ring according to claim 37, wherein said screw retaining means includes an outer cylindrical portion and a flange extending radially outward for engaging an outer edge of the aperture.

39. The snap ring according to claim 38, wherein said outer cylindrical portion has a center axis and has a gap situated on said outer cylindrical portion.

20 40. The snap ring according to claim 37, wherein said screw retaining means includes an opening eccentric to said center axis of said outer cylindrical portion thereof.

41. The snap ring according to claim 40, wherein said screw retaining means 25 further includes at least one groove located 180 degrees apart from said gap, said at least one groove engages an extension on the base plate and secures said snap ring in place after rotating said snap ring about said center axis.

42. A device for placement into an aperture of a base plate, wherein the aperture 30 includes a pocket, said device comprising screw retaining means mountable and movable on the plate between locked and unlocked positions relative to the aperture for preventing a screw from backing out from the base plate.

43. The device according to claim 42, wherein said screw retaining means includes an outer cylindrical portion.

44. The device according to claim 42, wherein said outer cylindrical portion includes a center axis, wherein said device is compressible about said center axis.

45. The device according to claim 42, wherein said screw retaining means includes an opening eccentric to said center axis of said outer cylindrical portion thereof.

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46. The device according to claim 42, wherein the pocket of the aperture includes a blind hole with a slightly larger circumference relative to said cylindrical portion, a cylindrical undercut for mounting said screw retaining means therein, and a spherical seat with aperture extending therethrough, and a locking tab.

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47. The device according to claim 46, wherein the spherical seat and aperture are machined into the plate to accommodate the screw.

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48. The device according to claim 47, wherein the spherical portion and aperture line up with said opening located on said screw retaining means during screw insertion.

49. The device according to claim 48, wherein the spherical portion and aperture therethrough are eccentric to the center axis of the blind hole.

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50. A bone plate assembly utilizing at least one bone screw for fixation of adjacent vertebrae of a spine comprising:

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a base plate including at least one aperture extending therethrough, wherein said at least one aperture is an elongated slot having a hole extending therethrough and walls forming a spherical seat a distance along a length of said slot to allow the screw to enter through said hole; and screw retaining means mounted and movable on said plate between locked and unlocked positions relative to said aperture for preventing the bone screw from backing out from said base plate.

51. The bone plate assembly according to claim 50, wherein said at least one aperture allows for the longitudinal movement of the screw along the distance of said slot while said screw retaining means is in said locked position.

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52. The bone plate assembly according to claim 51, wherein the screw includes a cylindrical screw head.

53. The bone plate assembly according to claim 50, wherein said at least one aperture allows for the screw to translate without being able to rotate about the spherical head of the other variation.

54. An insert for placement into an aperture of a base plate comprising screw retaining means mountable and slidably movable on a plate between locked and unlocked positions relative to an aperture for preventing a bone screw from backing out from the base plate, wherein said screw retaining means includes a bottom portion, a top portion, and two side portions, said bottom portion having a spherically-shaped recess, said top portion having a first recess forming a substantially U-shaped inner surface and a second surface extending arcually further radially outward relative to said first surface, and said side portions having lip means radially extending therefrom for engaging an undercut situated within the aperture of the base plate.

55. The insert according to claim 54, wherein said side portions further include an indentation that operatively engage over protrusions that extend into the aperture on the base plate.

56. A bone plate assembly utilizing at least one bone screw for fixation of adjacent vertebrae of a spine comprising:

30 a base plate including at least one aperture extending therethrough, said at least one aperture is an elongated slot having a hole extending therethrough and walls forming a spherical seat a distance along a length of said slot for allowing the screw to enter through said hole, wherein said walls include at

least one protrusion extending into said hole and at least one undercut situated within said aperture of said base plate; and screw retaining means mountable and slidably movable on said plate between locked and unlocked positions relative to said aperture for preventing a bone screw from backing out from the base plate, wherein said screw retaining means includes a bottom portion, a top portion, and two side portions, said bottom portion having a spherically-shaped recess, said top portion having a first recess forming a substantially U-shaped inner surface and a second surface extending arcually further radially outward relative to said first surface, and said side portions having lip means radially extending therefrom for engaging an undercut situated within the aperture of the base plate.

5 57. The bone plate assembly according to claim 56, wherein said at least one aperture allows for the longitudinal movement of the screw along the distance of said slot while said screw retaining means is in said locked position.

10 58. The bone plate assembly according to claim 56, wherein said at least one protrusion operatively engages said indentations of said screw retaining means in a locked position.

15 59. The bone plate assembly according to claim 56, wherein the screw includes a cylindrical screw head.

20 60. The bone plate assembly according to claim 56, wherein said at least one aperture allows for the screw to translate without being able to rotate about the spherical head of the other variation.

61. A bone plate assembly utilizing at least one bone screw for fixation of adjacent bones of a spine comprising:

a base plate including at least one hole extending therethrough;  
5 insert means operatively engaged within said at least one hole for accommodating the bone screw and screw retaining means mounted and movable within said insert means between locked and unlocked positions relative to insert means for preventing the bone screw from backing out from said base plate.